Monetary Integration Issues in Latin America: a multivariate assessment

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Monetary Integration Issues in Latin America: A Multivariate Assessment

Jean-Pierre Allegret[♣] and Alain Sand-Zantman[♦]

Summary: This paper assesses the monetary consequences of the Latin-American integration process. Over the period 1991-2007, we analyze a sample of five Latin-American countries focusing on the feasibility of a monetary union between L.A. economies. To this end, we study the issue of business cycle synchronization with the occurrence of common shocks. First, we assess the international disturbances influence on the domestic business cycles. Second, we analyze the impact of the adoption of different exchange rate regimes on the countries' responses to shocks.

Key words: Business cycles, OCA, Bayesian VAR, Latin American countries

JEL: C32, E32, F42

Introduction

The 1990s were characterized by an intensification of Regional Trade Agreements in the Americas. The main agreements are the Southern Common Market (MERCOSUR) –signed in 1991 between Argentina, Brazil, Paraguay, Uruguay (and more recently Venezuela), with Bolivia, Chili, Peru, Colombia, and Equator as associates- and the North American Free Trade Area (NAFTA) –signed in 1994 between Canada, Mexico and the United States with more and more agreements with other L.A. countries (Chili, Peru, Equator…)[1]. Since 1994, a Free Trade Area Agreement for the Americas has been discussed, as an extension of NAFTA. In the spirit of Eichengreen and Taylor (2004), this paper analyses the monetary consequences of this trade integration process. We consider a sample of five countries –Argentina, Brazil, Chile, Mexico and Uruguay- that account for some 70 per cent of the region's GDP spanning the period 1991-2007.

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[1] We can also mention the CARICOM (Caribbean Community and Common Market, 1973), the CACM (Centre America Common Market, 1960), CAN (Andean Community, 1969)

The main question raised in this paper refers to the feasibility of a monetary union between these countries. To this end, we study whether this set of countries is characterized by business cycle synchronization with the occurrence of common shocks, a strong similarity in the adjustment process and the convergence of policy responses. We especially focus our attention on two points. First, we try to determine to what extent international disturbances influence the domestic business cycles through trade and/or financial channels. Second, we analyze the impact of the adoption of different exchange rate regimes on the countries' responses to shocks. All these features are the main issues in the literature relative to regional integration and OCA process.

The present paper is linked to two separate strands of literature. The first one, dedicated to the debate of monetary union versus dollarization, includes numerous papers analyzing the situation of Central and Latin American countries (LAC) relative to the United States[2]. Whatever the criteria –real output fluctuations, prices co-movements, trade integration, and exchange rate variability, empirical studies suggest that dollarization is not an obvious solution, even for Mexico. Karas (2003) finds that Mexican output fluctuations have been negatively correlated with the American fluctuations. Alesina et al. (2003) show that if Mexico is more linked to the United States from the co-movements of prices standpoint, co-movements of outputs with the Euro zone and the United States do not exhibit significant differences. Hallwood et al (2006) find that none of the South American countries has prices and/or output disturbances significantly correlated with the United States. Their results exhibit some correlation of Brazilian, Chilean and Uruguayan permanent shocks with Argentina suggesting that monetary union could be a better solution than dollarization. Allegret and Sand-Zantman (2008) propose a semi-structural VAR approach and a state-space model and show the weak convergence of the economic policies between the Mercosur countries. They stress that the main impediments to the convergence of economic policy are the divergence of the exchange rate regimes inside the area, and the lack of financial structure convergence. The second strand of literature analyses the sources of business cycles fluctuations in emerging countries. Two lessons from this literature are especially interesting for our purpose. On the one hand, a large body of studies suggests that the main source of fluctuations originated from external factors. Aiolfi et al (2006) –considering a sample of four LAC3- identify the presence of a common regional factor. Taking into account the weak intra-regional trade integration, this result suggests that the regional business cycle (major turning points are common to the four countries) is driven by external variables and common external shocks. Maćkowiak (2007)

[2]. See for instance Alesina et al. (2003), Karas (2003), Larrain and Tavares (2003), Hallwood et al. (2006), and Allegret and Sand-Zantman (2007 and 2008).
[3]. Argentina, Brazil, Chile, and Mexico over the period 1970-2004.

builds structural VAR models with block exogeneity ensuring that domestic shocks do not affect external variables. His main result is that external shocks account for a major source of macroeconomic fluctuations in emerging countries4. More precisely, if US monetary policy shocks significantly affect domestic variables in emerging countries, the magnitude of fluctuations explained by these shocks is lower relative to shocks driven by other external shocks (such as world commodity prices shocks). All these results suggest the presence of a "continental business cycle" (Canova, 2005:243) driven by US shocks and/or by international shocks. On the other hand, Ahmed (2003) and Canova (2005) conclude that the financial channel is especially significant in understanding the influence of external shocks on domestic business cycle fluctuations in LAC. Using a dynamic panel setting with annual data over the period 1983-1999, Ahmed (2003) finds that US three months real interest rate shocks explain a significant share of output fluctuations in these countries. Canova (2005) shows, over the period 1990-2002, that US real shocks (demand and supply disturbances) exert a weak influence while US monetary policy shocks generates stronger output fluctuations in LAC. As a result, the financial channel is more significant than the trade channel5.

The remainder of this paper is organized as follows. Section 1 explains the methodology adopted in this paper and founded on Bayesian VAR models. Section 2 presents the macroeconomic variables included in the VAR. Section 3 proposes a method to consider non-stationarity and structural breaks of the selected variables. Section 4 presents the model analyses our main results. Section 5 concludes.

1. A Bayesian VAR Methodology

In the context of strong links of macroeconomic variables with complex feedback linkages, the Vector autoregression (VAR) and the Vector Error Correction Model (VECM) approaches constitute useful tools to catch the trends and interdependences between multiple time series. The VMA (vector moving average) representation of the reduced form allows us to express the current and past values of the shocks, to trace out their time path on the variables contained in the VAR system, and to compute the impact multipliers (deduced from the impulse response functions). The forecast error variance decomposition indicates the proportion of the movement in a sequence due to its own shocks versus shocks to the other variables. Thus, the convergence of evidence revealed by the tests,

[4]. Maćkowiak (2007) studies eight emerging countries (whose two South American countries: Chile and Mexico) with monthly data spanning the period from January 1986 to December 2000.
[5]. See also Ősterholm and Zettelmeyer (2007).

the impulse response functions, the forecast error variance decomposition and other forecasting properties give us some guidelines to choose between alternative theories. More frequently than in the case of monetary policy literature, the "regional unification" literature uses relatively large scale models with more than three of four variables. And contrary to the monetary case (Sims, 1996, Bernanke, 1996, Christiano, Eichenbaum and Evans, 1999), no common wisdom can facilitate the interpretation of impulse responses and forecast variance analysis.

One of the main issues of these experiments comes from the identification of shocks. We use here the Cholesky ordering. It is the usual and least theoretical method to orthogonalize shocks (this kind of "informal" structural VAR is usually called either recursive VAR or RVAR, or, as in Doan (2007), semi-structural VAR or SSVAR). The ordering is based on theoretical intuition and more formally on the results of the impulse responses and forecast error variance decomposition.

Undeniably, the sample is short and the number of variables fairly high. In this case, Litterman (1979, 1984) suggests specifying blurred restrictions on the mean and variance of the coefficients in a Bayesian VAR methodology. As indicated by Canova (2007), priors on the mean and variance of the variable allow dealing as with over parametrization than with "ad hoc" exclusions.
The choice of priors is the simplest one: overweighting the first lags of endogenous variables of each equation.

2. Variables Selection and Sample Period

Our choice of variables (see Appendix 1 for data sources) is in part based on the traditional one for VARs analyzing external shocks and macroeconomic packages in open economies, but also on the literature dedicated to the sudden stop problem (Calvo et al., 2004).

Each domestic VAR includes three external variables. As real external shocks, we consider (i) the Gross Domestic Product for the G7 (noted *LGDPG7*) and (ii) the world commodities prices excluding oil (noted *WCPNO*). Our choice to exclude oil from our commodities prices index is due to the fact that some LAC (for instance Brazil and Mexico) are both producers and consumers of oil. As a result, responses to shocks are difficult to interpret in such a situation. Furthermore, taking into account only food or agricultural products seemed too restrictive[6].

[6]. We perform alternative specifications using all commodities prices and food and agricultural products prices. Results do not change significantly.

The Emerging Economy spread index of J.P. Morgan (*EMBI*)[7] accounts for the international financial shock. Many studies chose US interest rates or international interest rates –such as LIBOR- to estimate the impact of external financial shocks on emerging markets. We prefer to use the *EMBI* in order to disentangle monetary policy shocks and financial shocks. Further, over our sample period, the *EMBI* does not seem significantly influenced by *LIBOR*, confirming the González-Rozada and Levy-Yeyati (2005) results which show that spreads are determined by global factors[8]. Uribe and Yue (2006) analyze the respective influence of *US* interest rates and *EMBI* shocks on the macroeconomic fluctuations in a sample of seven emerging countries covering the period 1994-2001. An important finding is that *EMB*I shocks exacerbate the *US* interest rate shocks, implying a strong macroeconomic volatility in the studied emerging countries.

For the domestic variables (noted for each country "*i*", *i = A* for Argentina, *B* for Brazil, *C* for Chile, *M* for Mexico, and *U* for Uruguay), we took the foreign reserves noted *i_FOREX* (as proxy for the balance of payments, and in particular for financial account), Gross Domestic Product (*i_GDP*), Consumption Prices Index (*i_CPI*), the nominal money market interest rate (*i_R*) and the real effective exchange rate[9] (*i_ER*).

Calvo et al. (2004) stress that sudden stop episodes are characterized by both international reserves losses and sharp current account reversals. The former increases the country vulnerability to shocks while the latter leads to output and employment contractions. Balance of payments quarterly data are not reliable and subject to sizable revisions. As a result, our VARs does not include current account data. As a proxy for sudden stop problems, we chose to include central bank's foreign exchange reserves. In order to test the robustness of the results, we substitute *i_TCT* -the deseasonalized exports-imports ratio- to *i_FOREX*. The *TCT* ratio represents a proxy for the intertemporal constraint of the current account: a decrease in capital inflows imposes the reduction of absorption in order to increase exports and decrease imports. Interestingly, the results do not change significantly. As a result, we prefer to consider only the

[7] We merged two time series: the EMBI for the period 1991Q1-1997Q4 and the EMBI+ from 1998Q1. As indicated in Cunningham (1999), the main differences between these indices are (i) the number of financial instruments embodied (the EMBI tracks returns and spreads on Brady Bonds and some other restructured sovereign debts, the EMBI+ tracks returns on a wider range of instruments), (ii) the number of countries (11 for the EMBI, 16 for the EMBI+). However, in both indices the weight of the LAC (Latin American countries) is very important (respectively 83.8% and 70.2%). Amongst the LAC, both Argentina and Brazil account for 47.6% of the EMBI+. In 1999, J.P.Morgan released a new index, the EMBIG (for "global") embodying more countries (27) and more titles. In this last index, LAC decreased to 61.5%.

[8]. We perform different experiments in our VARs: first, we include both *LIBOR* and *EMBI*; second, we include only *LIBOR*. Results do not significantly change. Granger causality tests do not exhibit relations between *EMBI* and *LIBOR*.

[9]. An increase (decrease) in the real exchange rate means real depreciation (appreciation).

FOREX variables in order to avoid some interpretation difficulties owing to the fact that the *TCT* ratio obeys in part to competitive factors, and not exclusively to financial factors.

Exchange rate regimes and real bilateral exchange rate variability constitute significant concerns for trade and financial integration process. In Mercosur countries, these concerns became significant after 1998, when the region was hit by a wave of international shocks (Machinea, 2004). From this perspective, Silva et al. (2004), using a conventional Mundell-Fleming framework, provide suggestive conclusions concerning the impact of different exchange rate regimes on the synchronization of business cycle fluctuations. They compare the situation of Argentina and Brazil after different shocks (domestic or external). Their VECM suggests that Argentina followed strict "currency board" rules (with a very quick adjustment between the foreign reserves and the monetary base in the error correction expression) while Brazilian monetary policy had a discretionary character based on the sterilization policy of the central bank (i.e. a sluggish adjustment of the E.C.M.). Briefly, the two countries experienced dissimilar mechanisms of adjustment to similar negative external shocks, the problem being exacerbated after the Brazilian exchange rate regime collapse in 1999.

Appendix 2 shows the exchange rate regimes adopted by each country over the same period. At the beginning period (1991), the set of countries ranges from hard peg (Argentine currency board) to intermediate regimes, while the end of the period exhibits a clear switch toward floating regimes. We try to determine to what extent different exchange rate regimes can explain different adjustments to similar shocks. Canova find "little evidence supporting the idea that the exchange rate regime matters for both the magnitude of output responses and the mechanics of transmission of US shocks" (Canova, 2005: 246). Similarly, Maćkowiak (2007) concludes that the contribution of external disturbances to domestic fluctuations is independent of the exchange rate regime. On the other hand, Allegret and Sand-Zantman (2008) find that exchange rate regimes matter to explain the different responses of Argentina, Brazil and Uruguay to similar shocks. To this end, the VAR models take into account the question of the exchange rate through the real effective exchange rate for each of the five countries of the sample.

Our analysis focuses on the period following the recovery (due to the return international capital flows). The sample is relatively short: indeed, not only the quality of data for long periods is low in emerging countries but also during the 80s, the five economies were very instable mainly due to the debt crisis and the bouts of hyperinflation: such disturbances make data processing very complex and unstable. Therefore, our study begins in 1991 by taking into account more stabilized economies. In addition, as our approach of monetary integration is based on business cycle dynamics, we use quarterly data. Such data are only

available and comparable since 1990 for the five countries. Thus, the paper uses quarterly frequency for the period 1991-Q1-2007-Q1.

3. Non-Stationarity and Structural Breaks: the Special Case of Emerging Economies

As noted above, the emerging economies case is not the simplest one to use times series methodology. Since the seminal works of Nelson and Plosser (1982), most macroeconomic time series in level are considered unit root process (i.e. generally I(1), and in some cases I(2)); and for the industrialized economies, availability of long run times series and economic stability allowed to hinge on unit root and cointegration common tests.

On the same sample than Nelson and Plosser, Perron (1989) challenged this interpretation, indicating that most macroeconomic variables are trend stationary, coupled with structural breaks. Looking at the Latin-American macroeconomic time series, we assert the same hypothesis: indeed, in the case of Latin America, as for other Emerging countries, the econometricians had to take into account structural breaks due to non random external and internal shocks and change of policy regimes. The right way to deal with this question consists (in the Perron procedure) to test for unit roots in the presence of structural change at a known date. If the date of the break is uncertain, other tests are available (Vogelsang and Perron, 1998, or Zivot and Andrews, 2002) on common softwares. However, as shown in Le Bihan (2004) all of these procedures are powerless when the number and date of the break are unknown. Overall, the combination of a short sample and multiple breaks weaken the break diagnosis compared to the following unit root test.

We choose a rougher but probably more secure method. First we identified the noticeable breaks of the figures[10] as being well-known historical ones (due for instance to a balance of payments crisis, or switches of policy regime): the results are displayed in Appendix 3. As particular (and generally deterministic) events, these breaks can hardly be considered as the *n.i.d.* stochastic innovations of a random walk. Then, in order to the macroeconomic series, we clean them from the various deterministic trends and intercept leaps, using simply time trends and dummy variables. We finish with a common A.D.F. test, finding all series stationary.

Thus, we can exclude any cointegration relationship but a VAR in level is an available alternative to the VECM one; so we choose a recursive semi-structural approach for a VAR in level of the detrended series.

[10]. To this end, we use Chow tests.

4. The model and the main results.

The model

The following order of Choleski factorization is deduced from our theoretical interpretation of the contemporary correlation matrix of the reduced form residuals of each country model and from block exogeneity Wald tests. The number of lags –two in each model- has been selected using the common set of criteria and tests. As the inverse roots of the AR polynomial lie in the unit circle, VARs satisfy the stability condition. External variables are considered as the most exogenous. We assume that real external variables are predetermined relative to external financial ones. In addition, we consider that the *GDP* of the G7 countries exerts an influence on commodities prices through a demand effect.

For domestic variables, different plausible orders have been experimented. They do not significantly change results except if *i_FOREX* is considered as the most exogenous domestic variables. But in this case results are largely irrelevant from an economic viewpoint.

As a result, for each economy we test the following VAR:

$$\begin{pmatrix} CYC\_LGDPG7(t) \\ CYC\_LWCPNO(t) \\ CYC\_EMBI(t) \\ CYC\_Li\_GDP(t) \\ CYC\_Li\_CPI(t) \\ CYC\_Li\_FOREX(t) \\ CYC\_i\_R(t) \\ CYC\_Li\_ER(t) \end{pmatrix} = \begin{pmatrix} C_{1(1,1)} & \cdots & & & C_{1(1,8)} \\ \vdots & & & & \vdots \\ & & C_{1(i,j)} & & \\ \vdots & & & & \vdots \\ C_{1(8,1)} & \cdots & & & C_{1(8,8)} \end{pmatrix} \begin{pmatrix} CYC\_GDPG7(t-1) \\ CYC\_LWCPNO(t-1) \\ CYC\_EMBI(t-1) \\ CYC\_Li\_GDP(t-1) \\ CYC\_Li\_CPI(t-1) \\ CYC\_Li\_FOREX(t-1) \\ CYC\_i\_R(t-1) \\ CYC\_Li\_ER(t-1) \end{pmatrix} +$$

$$\begin{pmatrix} C_{2(1,1)} & \cdots & & & C_{2(1,8)} \\ \vdots & & & & \vdots \\ & & C_{2(i,j)} & & \\ \vdots & & & & \vdots \\ C_{2(8,1)} & \cdots & & & C_{2(8,8)} \end{pmatrix} \begin{pmatrix} CYC\_GDPG7(t-2) \\ CYC\_LWCPNO(t-2) \\ CYC\_EMBI(t-2) \\ CYC\_Li\_GDP(t-2) \\ CYC\_Li\_CPI(t-2) \\ CYC\_Li\_FOREX(t-2) \\ CYC\_i\_R(t-2) \\ CYC\_Li\_ER(t-2) \end{pmatrix} + \begin{pmatrix} e_{CYC\_LGDPG7} \\ e_{CYC\_LWCPNO} \\ e_{CYC\_EMBI} \\ e_{CYC\_Li\_GDP} \\ e_{CTC\_Li\_CPI} \\ e_{CYC\_Li\_FOREX} \\ e_{CYC\_i\_R} \\ e_{CYC\_Li\_ER} \end{pmatrix}$$

Results

Using this framework, we combine the impulse response functions (tracing out the time paths of the effects of pure shocks on the set of variables), and the fore-

cast error variance decomposition (indicating the proportion of the movements in a sequence due to its own shocks versus other variables). These experiments aim at identifying what kind of shocks, real or nominal, drive economic fluctuations in the three countries.

This allows us to assess the similarities in the reactions of macroeconomic variables to these shocks. At the same time, we will get a first outline of the specific -versus common- economic consequences of shocks in terms of spontaneous adjustments, as well as in terms of policy responses. The results are presented in Appendix 4 and 5.

Responses of domestic variables to external shocks: is transmission real or financial?

In this paragraph, we try to identify to what extent international shocks are transmitted to domestic variables through real or financial disturbances. To this end, we consider the responses to shocks and variance decompositions of all domestic variables –except *FOREX*- in the five studied countries.

Broadly speaking, variance decompositions show that all studied countries are significantly influenced by foreign variables. For instance, in Argentina, Brazil, and Chile foreign variables explain at least 29% of the *GDP* variance decompositions after 16 quarters. In Mexico and Uruguay, the shares are 16.1% and 20% respectively. In addition, no domestic variables –except *i_GDP* themselves- exert a higher influence than foreign innovations in all countries. LA countries differ according to the specific influence of real and financial variables. If we consider real foreign variables, i.e. *GDPG7* and *WCPNO*, we see that both *GDPG7* and *WCPNO* innovations explain a significant part of the *GDP* variance in Brazil (26.5% and 23.5% respectively) while in Chile *WCPNO* shocks explain 39% of the *GDP* variance. Argentina is more influenced by innovations on *WCPNO* than on *GDPG7* ones, but the respective shares are considerably lower than for Brazil and Chile. If the variance decomposition of Uruguayan *GDP* does not seem impacted by real foreign variables, it does not mean that Uruguay is a closed economy. Indeed, economic activity in this country depends mainly on Argentine and Brazilian business cycles. VAR models built in this paper do not take into account such interdependencies between LAC.

A large body of empirical literature dedicated to business cycle in LAC stresses that growth in LAC follows international capital flows. More precisely, these studies suggest that the behavior of capital inflows is pro-cyclical: they tend to increase when growth in LAC improves. As a result, we can expect a significant influence of *EMBI* shocks on *GDP* during the period on our sample of countries. On this point, our results are mixed since international financial shocks matter only in Argentina and Uruguay. In the former, *EMBI* innovations explain more than 14% of the *A_GDP* variance after 8 quarters while in the latter, *U_GDP* variance decompositions suggest that 12.3% of its variance is ex-

plained by the international financial shocks after 4 quarters and around 15% after 8 quarters.

It is important to stress that in these two countries, trade channel, based on *GDPG7* and *WCPNO* shocks, are less important than in the three other countries. From this standpoint, it seems relevant to distinguish two groups of countries: a first one, including Brazil, Chile and Mexico in which trade channels predominate and a second group, composed of Argentina and Uruguay where the financial channels exert the main influence on *GDP* variances.

As expected, in countries where the responses are significant (Argentina and Chile), *GDP* increases after a shock on *GDPG7*. The positive influence of *GDPG7* means that improvement (vs degradation) of the business cycle in G7 countries can result in an increase (vs slowdown) of growth in LAC. However, responses are significant only contemporaneously (Argentina) or in the short-run (4 quarters in Chile). In countries where *GDP* responses to *GDPG7* shocks are insignificant, this result rests on different reasons. As stressed above, Uruguay tends to respond more to the Argentinean and Brazilian shocks than to industrial country ones while Brazil is a closed economy relatively to other studied countries. Mexico shows a priori a surprising result. Indeed, the degree of openness (45% of GDP) is considerably higher than Brazil one while our result suggests the lack of influence of *GDPG7* fluctuations on the Mexican economy. Such finding does not seem contradictory with the high degree of openness of Mexico. It is important to recall that, over the considered sample period, Mexico had experienced both a weak economic growth and a lower volatile *GDP* than in other studied LA countries. As a consequence, as showed in appendix 4, *M_GDP* exhibits weak or insignificant responses to shocks envisaged in this paper[11]. In addition, as stressed by the International Monetary Fund, in 2001-2002 Mexico experienced, for the first time over our sample period, a weak economic activity explained not by domestic factors but by the US economic slowdown[12]. In Argentina, Brazil and Uruguay, consumption prices increase after the *GDPG7* shock. But responses of consumption prices are weakly significant (in the case of Argentina and Uruguay) or very short-lived (for Brazil). Interest rates and real exchange rates responses exhibit a similar trend: they are insignificant or short-lived.

In all countries except Uruguay, *GDP* increases after a shock on commodities prices (*WCPNO*) confirming the importance of commodities in LACs' business cycles. Not only contemporaneous responses are significant and positive but we also observe significant persistent effects. Interestingly, *CPI* strongly increases in Uruguay after a shock on *WCPNO* and this increase prevails over time. As Uruguay is both an exporter and importer of primary commodities, it is

[11]. At the same time, *GDPG7* volatility had been particularly low.
[12] See IMF (2002), *IMF Country Report* N°02/237, October.

difficult to disentangle between a demand effect (exports) and a supply effect (imports). The response of *U_GDP* to a shock on *WCPNO* suggests that the second effect is probably the most relevant: over the considered period, Uruguay suffers from increases in commodities prices. Variance decompositions of *U_GDP* and *U_CPI* confirm this observation: while *WCPNO* innovations explain around 3% of the Uruguayan *GDP* variance after 16 quarters, it explains more than 31% of the *CPI* variance. In all countries, responses of interest rates and real exchange rates to *WCPNO* innovations are short-lived or weakly significant.

In countries where the international financial shock is significant, *GDP* decreases after a shock on *EMBI*. The magnitude of the *GDP* response is important in Argentina and Uruguay, and to a lesser extent in Mexico. Variance decompositions of *GDP* support this result. In both Argentina and Uruguay, *EMBI* innovations explain more than 15% of the *GDP* variance after 16 quarters, while in Mexico this share is considerably lower (5%). Our findings confirm Allegret and Sand-Zantman (2008) about the specific sensitivity of Argentina to *EMBI* shock. During the first half of the 90s, Argentina was one of the main borrowers in international capital markets enjoying very favorable financing conditions, while in the second half of the decade the economy suffered from a sudden-stop of capital inflows. In addition, the monetary policy constraints due to the currency board limited the ability of authorities to react in the face of *EMBI* shocks, inducing strong and ample macroeconomic variability.

As expected, in the major part of our sample countries, the real exchange rate depreciates after the *EMBI* shock. Indeed, an increase in the risk premium implies that investments in emerging markets are less attractive leading to capital outflows. However, the responses of the exchange rates are short-lived.

The Chilean case is particularly interesting. While the Chilean spread stayed substantially below EMBI+ or Latin American spread over the period, *C_GDP* responds negatively to *EMBI* shock. Even if the response is weakly significant from a statistical point of view, this result suggests that this type of shock is global, i.e. affects all countries, even economies beneficing from low idiosyncratic risk premium. Recall that the macroeconomic situation of this country and the monetary framework introduced in 1991 significantly decreases its risk premium. The responses of the domestic interest rates strengthen this observation. Domestic interest rates increase after the *EMBI* shock, suggesting a financial transmission of *EMBI* shocks to domestic variables. If this transmission must be nuanced for Argentina, Brazil, Mexico and Uruguay owing to the fact that interest rates responses are short-lived and/or weakly significant, the response of the Chilean interest rate deserves attention. Indeed, not only *EMBI* shock is followed by an increase in interest rate in this country, but the international financial shock explains more than 21% of the *C_R* variance after 16 quarters. In other words, Chile cannot avoid a financial transmission through its interest rate –

which increases significantly- even if the effect is short (due to the credibility effect of its monetary policy framework).

The behavior and the role of FOREX (foreign reserves) variable: the relevance of the sudden stop

Two main points characterize the sudden stop literature. First, external factors exert a decisive influence on capital inflows into emerging markets. Second, depreciation results in contractionary output in emerging markets while it produces the traditional expansionist effects in industrialized countries (Calvo and Reinhart, 2001). Indeed, exchange rate crises in emerging markets are followed by a sudden stop to capital inflows. These countries suffer from reserve losses and severe reversal in the current account deficit. Such reversal is based on a major decline in aggregates.

In order to assess the relevance of the sudden stop literature, we determine what variables –foreign or domestic, real or financial- exert the main influence on *FOREX* included in our VARs as a proxy of international capital flows. The theoretical prediction is that international financial shocks, here the *EMBI* shock- are the main variables influencing *FOREX* in our five countries. In addition, we analyze the influence of *FOREX* on other domestic variables. According to the sudden stop literature, a negative shock on *FOREX* must lead to a contraction in *GDP*.

Interestingly, from the sudden stop literature standpoint, *FOREX* is influenced by international variables, and more specifically by financial variables. *FOREX* responses *WCPNO* shocks and variance decompositions of *FOREX* exhibit the weak influence of world commodities prices except in Mexico. In this country, international reserves increase after the *WCPNO* shock and the response remains significant over 4 quarters. In addition, *WCPNO* innovations explain 11% of the *FOREX* variance. It is the main explanatory variable of *FOREX* variance after *M_CPI*. *GDPG7* shocks do not lead to significant responses of *FOREX* except in Brazil where international reserves increase contemporaneously to the shock. The international financial shock produces the expected effects when significant. Thus, an increase in the spread –meaning degradation in the financial conditions for emerging countries- leads to a decrease in *FOREX* in Argentina and Brazil, and to a lesser extent in Chile after 3 quarters. Variance decompositions support the significant influence of *EMBI* on the behavior of *FOREX*. In Argentina, Brazil and Chile, *EMBI* innovations explain 15.4%; 8.2% and 7.8% of the *FOREX* variance. In the three countries, *EMBI* is its main explanatory variable.

Few domestic variables react to *FOREX* innovations. In Argentina, consumptions prices increase after a shock on *FOREX* at the impact and after 3 quarters. This response is conformed to the conventional wisdom: in a currency

board regime, monetary expansion rests on the accumulation of international reserves by the central bank. Chilean prices increase in the aftermath of *FOREX* innovations. In the two countries, *FOREX* innovations are one of the main explanatory variables of the variance of *CPI*. Shocks on *FOREX* lead to real exchange rates appreciations. This reaction is especially persistent in Uruguay and Argentina, but to a lesser extent in this country. The fact that the *FOREX* shock generates few domestic fluctuations does not necessarily contradict the sudden stop literature. Indeed, as stressed by Izquierdo et al. (2007), episodes of financial volatility tend to produce effects on real variables only in the short-run. A plausible explanation of our deceptive results is that the more significant effects of sudden stop on domestic variables are absorbed extremely rapidly, within one or two quarters. VAR models in level are not well-equipped to detect these types of changes. Indeed, such models analyze the responses of macroeconomic variables to shocks of standard magnitude (usually one standard deviation), and not to unusual disturbances proper to crisis episodes. In addition, the main purpose of VAR models is not to identify crisis events. Crisis episodes are relevant only if they lead to structural breaks in the studied macroeconomic series.

Responses of domestic variables to domestic shocks

Shocks on *GDP* are interpreted as real ones. After a real domestic shock, we observe significant responses of *CPI* in Argentina, Brazil and Uruguay. Prices decrease after the shock. Responses are short-lived in both Brazil and Uruguay while Argentine prices react at medium run. The decrease in prices in the aftermath of *GDP* shock suggests that such shock produces a supply effect. Variance decompositions of *CPI* exhibit persistent effects. In the medium-long run, the share of the *CPI* variance explained by *GDP* innovations amounts to 15% after 16 periods in Argentina. Interest rate responses are weakly significant or short-lived in all countries. Responses of real exchange rates to *GDP* shocks are very short-lived and weakly significant. As expected, a shock on *GDP* is followed by a real exchange rate appreciation. Overall, *GDP* shocks do not lead to significant responses of other variables. Variance decompositions bring out the fact that few other domestic variables have their variance in part explained by *GDP* innovations. Over the studied period, as suggested by Allegret and Sand-Zantman (2008) for the industrial production index, the *GDP* is an adjustment variable. This similarity across our five countries is explained by monetary policy constraints faced by domestic authorities either in the case of a hard peg or in the case of an economic policy based on the fight against inflation.

We consider a shock on *CPI* as a nominal demand one. Except in Brazil –where the *GDP* increases over 3 quarters in the aftermath of the shock- *CPI* shocks do not lead to significant responses of real variables, i.e. *GDP*. However, innovations on prices exert an influence on other domestic variables. Given the importance of the inflationary history of numerous LA countries, the responses

of interest rates are particularly significant. Responses of interest rates allow us to discriminate between credible and less credible countries. In Argentina and Chile, interest rates decrease or do not react after a *CPI* shock. In these two countries, inflation expectations are well anchored by the monetary regime in place in each country. Recall that from 1991 to 2001, Argentina had experienced a currency board arrangement while Chile had adopted an inflation targeting framework since 1991. In countries with soft pegs and a monetary policy not based on inflation targeting framework –as Brazil, Mexico and Uruguay- inflation expectations are imperfectly anchored. So, in such countries, shocks on prices induce higher fluctuations. Variance decompositions exhibit a clear picture. In Argentina and Chile, *CPI* innovations explain a mild or marginal share of the interest rate variances, respectively 8.7 and 0.2 contemporaneously; and 12.8 and 1.8 after 16 quarters, while in Brazil the respective shares are 70.9% and 68.2%. In this latter country interest innovations explain only a weak share of the *CPI* variance (0% contemporaneously and 10.2% after 16 quarters). As expected, *CPI* shocks lead to real exchange rate appreciations. In comparison with countries enjoying an imperfect monetary credibility, the responses of the real exchange rate are short-lived in Argentina and Chile.

The innovations on nominal interest rates are monetary policy shocks. The adjustments after an interest rate shock are rapid in the five countries: the main part of the adjustment for the set of endogenous variable lasts four quarters. Most frequently, variance decompositions suggest that innovations on interest rates are not a relevant explicative variable. The most impacted domestic variable is the real exchange rate. In Argentina, Brazil, and Mexico interest rate increases are followed by contemporaneous real exchange rate depreciations. Interestingly, *FOREX* does not respond to interest shocks. In other words, increasing the domestic interest rate is insufficient to favor the accumulation of international reserves. Such result is in accordance with the sudden stop literature that suggests that *FOREX* responds more to global shocks than domestic ones.

Finally, real exchange rate shocks do not produce significant fluctuations in other domestic variables. Variance decompositions confirm this weak influence of the *Real Exchange Rate* over the sample period. We must remember that during the main part of the period, monetary authorities had smoothed its volatility, either because its adoption as "official" nominal anchor, or to avoid "pass through" effects (even after the adoption of inflation targeting and flotation regimes). However, concerning the *GDP*, impulse responses exhibit an interesting feature when significant: *GDP* decreases in the aftermath of the real depreciation (Brazil, Mexico, Chile and Uruguay). Three competing explanations are advanced in this paper. First, real depreciations may be synonymous of economic activity slowdown in the medium-term. Unfortunately, this interpretation is not confirmed by the behavior of the *FOREX* variable. Indeed, while a

negative response of *FOREX* to a real depreciation is expected –due to capital outflows-we observe in fact insignificant reactions of this variable. Real exchange rate innovations do not explain a significant share of *FOREX* variance in the five countries. Second, an alternative explanation of the negative relationship between *GDP* and real depreciation rests on the presence of negative balance sheet effects. The inability to borrow abroad in local currency –the so-called original sin- and the dollarization of the domestic economy can induce currency mismatches in the balance sheets of public and private agents. Using the degree of dollarization estimated by Reinhart, Rogoff and Savastano (2003), such an explanation seems relevant only in Uruguay[13]. Finally, a last explanation, most likely relevant in countries with low degrees of dollarization (Brazil, Chile and Mexico) suggests that the negative correlation between *GDP* and real exchange rate depreciations stems from shocks that induce both a real depreciation and a decline in *GDP*. Negative terms of trade shocks result in such negative correlation.

Conclusion

This work leads us to five main conclusions. First, our results converge to indicate that Latin American countries are influenced by foreign variables, either the real one for Brazil and Chile, or the financial one for Argentina and Uruguay; curiously, Mexico seems more independent from foreign influence[14]. Second, contrary to several studies, we find that real channels seem as important as financial ones in explaining the influence of foreign variables on domestic ones in the majority of the studied LACs. Third, our attempt to test the relevance of the sudden stop literature leads us to mixed conclusions. If our proxy of international capital inflows –the *FOREX* variables- is significantly explained by foreign financial variables, the analysis of domestic variable responses to *FOREX* shocks does not follow the predictions of common knowledge. Fourth, our estimates do not allow us to distinguish countries according to their exchange rate regimes. A better distinction to analyze the responses to similar shocks may be between the credibility degrees of our economies. Finally, from an OCA perspective, our study suggests that foreign variables engender a near-common

[13]. According to the authors, Argentina and Brazil belong to Type I dollarization in which domestic and external liability dollarization co-exist; Uruguay is a dollarized economy of Type II where dollarization is predominantly of a domestic nature; and Chile and Mexico are Type III dollarization: the main part of debt in foreign currencies is external. Degrees of dollarization differ among our countries: high in Argentina (index 20 on a scale that goes from 0 to 30) and Uruguay (21), but weak in Brazil (7), Chile (7) and Mexico (5).

[14] Such result seems paradoxical; but using the international and domestic industrial product indexes -*IPI*- instead of the *GDP* reveals more significantly the links between US and Mexican economies.

business cycle in the region. Indeed, LACs tend to react similarly to the same foreign shocks. An important question is to determine to what extent a monetary union may insulate against such shocks. On this point, Edwards (2006) obtains a negative answer. Using probit panel regressions to investigate whether countries forming a monetary union have a lower occurrence of sudden stop episodes and of current account reversal episodes, and whether they are better able to absorb external shocks, he finds that belonging to a currency union has not lowered the probability of a sudden stop or a current account reversal, and external shocks have been amplified in currency union countries.

A next step of this paper could be the building of a VECM (Vector Error Correction Model) able to embody short and long run dynamics, allowing us to focus on respective speeds of adjustment. Indeed, very different speeds of adjustment could prejudice any project of monetary integration (except obviously for the endogenous OCA perspective).

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Appendix 1 Data and Sources

Data	**Sources**
GDP Group of Seven	OECD
World commodities prices excluding oil	IMF, International Financial Statistics
EMBI	Ministry of Economy and Production of the Republic of Argentina (http://www.mecon.gov.ar/peconomica/basehome/infoeco_ing.html)
GDP	IPEA (http://www.ipea.gov.br) for Argentina, Brazil, Chile, and Mexico Central Bank of the Republic of Uruguay
Consumption Prices Index	IMF, International Financial Statistics
Foreign Exchange Reserves	IMF, International Financial Statistics
Money Market Interest Rates	IMF, International Financial Statistics for Argentina, Brazil, Mexico, and Uruguay Central Bank of Chile for Chile
Real Exchange rates	IMF, International Financial Statistics for Chile and Uruguay Central Bank of Argentina for Argentina IPEA for Brazil OECD for Mexico

Appendix 2 Exchange Rate Regimes in the Selected Latin American Countries

Countries	*Year/Month*	*Exchange rate regime*	*Countries*	*Year/Month*	*Exchange rate regime*
Argentina	1990-M1	Independently floating	***Brazil (cont.)***	1998-M4	Forward-looking crawling peg
	1991-M1	Horizontal band		1999-M1	Independently floating
	1991-M3	Currency board	***Chile***	1990-M1	Backward-looking crawling peg
	2001M12	Managed floating		1998-M9	Forward-looking crawling peg
	2004M11	Other tightly managed floating		1999-M9	Independently floating
Brazil	1990-M1	Backward-looking crawling peg	***Mexico***	1990-M1	Forward-looking crawling peg
	1990-M3	Managed floating		1994-M12	Independently floating
	1991-M5	Backward-looking crawling peg	***Uruguay***	1990_M1	Backward-looking crawling peg
	1994-M7	Tightly managed		1992_M1	Forward-looking crawling peg
	1995-M3	Backward-looking crawling peg		2002-M6	Independently floating

Source: from A. Bubula and I. Ötker-Robe's Database.

Appendix 3: Structural breaks

International Variables

The Commodity Prices and the *EMBI* are both marked by a structural break from the last quarter of 2001, due to the simultaneity of a Commodity Prices hiking and a decrease of *EMBI*.

Domestic Variables

Argentina :
Except the economic mayhem at the beginning of the 90s, the only structural break (intercepts and trends) comes from the exchange rate collapse of 2002. Attacks on Foreign Reserves are perceptible since 2001, with the unhooking of both the Foreign Reserves and the Interest Rate. About one year later, it hits the Exchange Rate, the *GDP* and the *CPI*.
Let us note in particular that the Tequila contagion (after the Mexican Crisis of 1994-95) is not obviously perceptible.

Brazil:
Two well known events are worthy of note: the Real Plan in 1994 and the currency crash of 1998-99. But in 2002, the Argentinean crisis contagion and the political uncertainty of the presidential election weighted on the Exchange Rate. Except this point, we had to introduce a break for 1994 in the *CPI*, the Foreign Reserves, and the Interest Rate (but curiously neither for the real Exchange Rate nor the *GDP*). The 1998-1999 crisis significantly hit the Exchange Rate and the Foreign Reserves (but neither the *CPI* nor the interest rate).

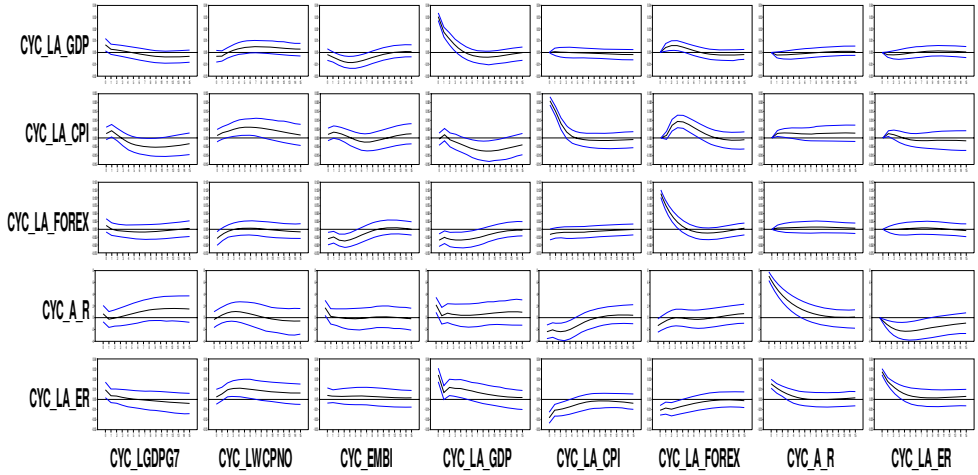
Chili:
The Chilean economy is particularly sensible to international financial mayhem: so, the main break is due to the Asian Crisis, in 1997, hitting all the variables except the *GDP*. But the uncertainty following the Argentinean crisis is perceptible as much on the Exchange Rate as on the Interest Rate.

Mexico:
Obviously, the Currency Crash of 1994-95 hit all the real and nominal variables, beginning in the last quarter of 1994 with the Foreign Reserves, the Interest Rate, and then hurting the Exchange Rate, the *CPI*, and the *GDP* in 1995.

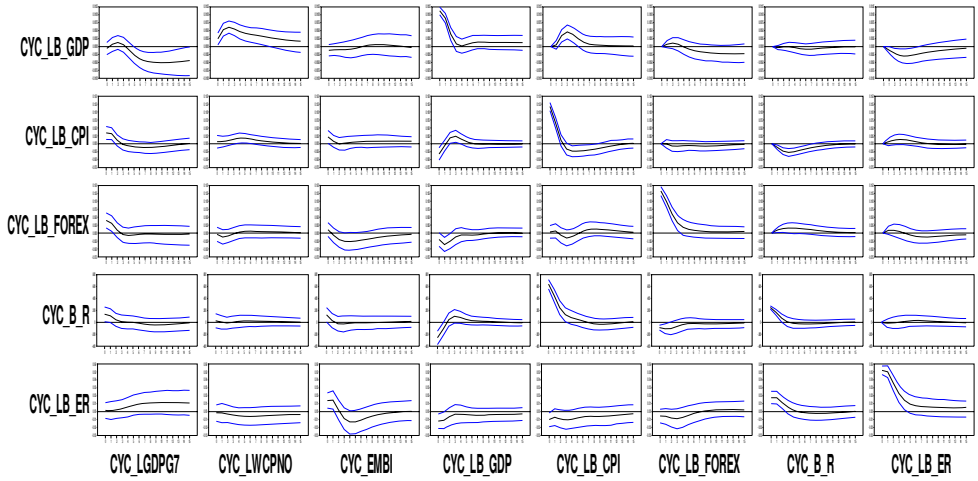
Uruguay:
The introduction of structural breaks in the case of Uruguay could be discussed. Although some shocks are obviously non-random ones, the high frequency of macro-fluctuations in the Uruguayan case turns break detection difficult. However, two shocks are clearly perceptible, with a break on the *GDP* (due to the Brazilian Currency Crash at the end of 1998) and a break on all the macroeconomic variables (except the CPI) after the Argentinean Crisis of 2002.

Appendix 4 Forecast Error Impulse Responses of One Standard Deviation (Innovations ±2 SE)

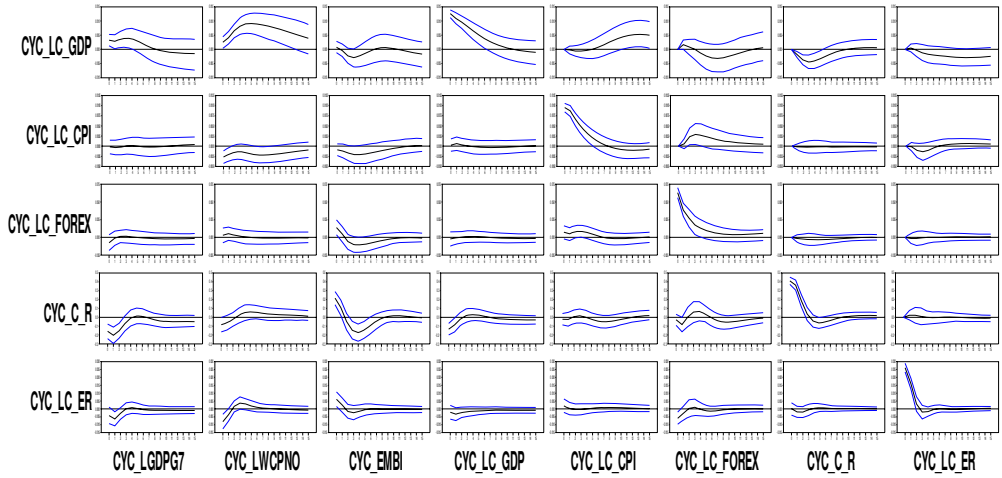
Argentina



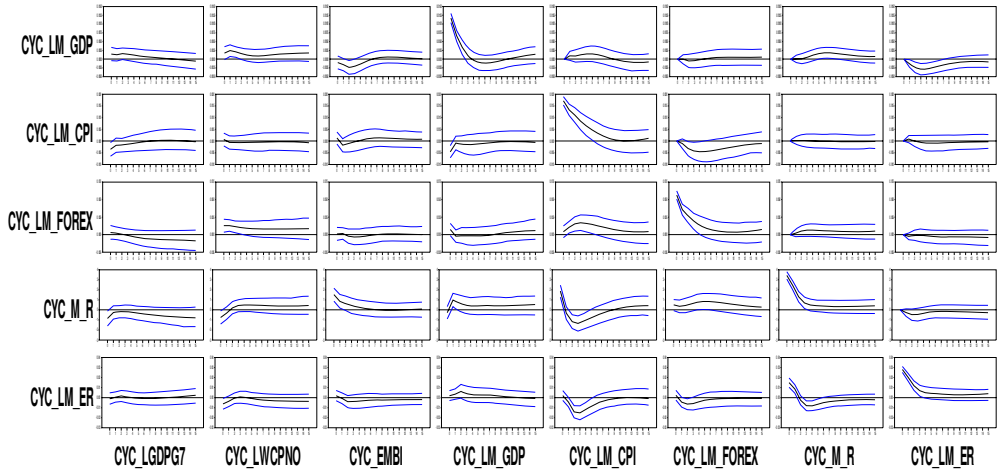
Brazil



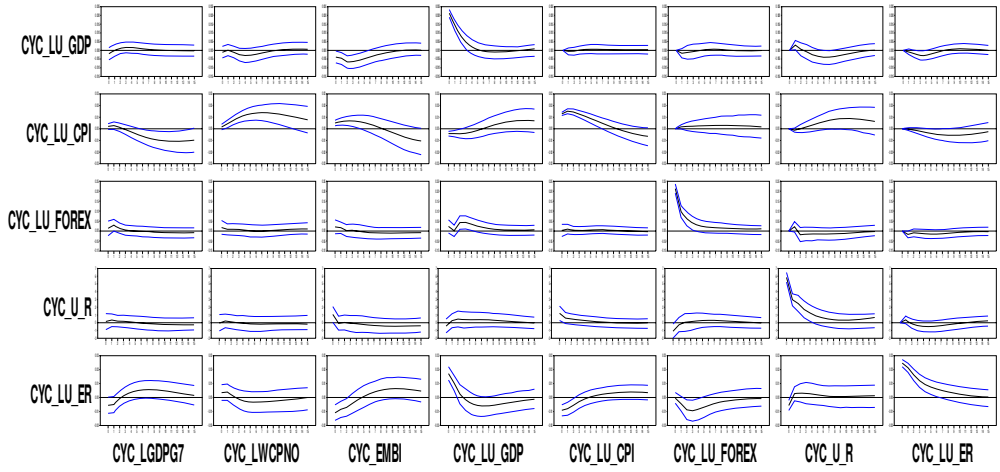
Chile



Mexico



Uruguay


CYC_LU_GDP
CYC_LU_CPI
CYC_LU_FOREX
CYC_U_R
CYC_LU_ER
CYC_LGDPG7
CYC_LWCPNO
CYC_EMBI
CYC_LU_GDP
CYC_LU_CPI
CYC_LU_FOREX
CYC_U_R
CYC_LU_ER

Appendix 5 Forecast Error Variance Decomposition, in percentage

Argentina

Decomposition of Variance for Series CYC_LA_GDP

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LA_ GDP	CYC_LA_ CPI	CYC_LA_ FOREX	CYC_A_ R	CYC_LA_ ER
1	4.19	1.17	0.20	94.43	0.00	0.00	0.00	0.00
2	3.70	1.64	1.24	91.28	0.05	1.44	0.35	0.28
4	3.34	1.47	7.08	81.09	0.05	5.39	0.83	0.73
8	3.05	5.04	16.13	68.04	0.04	6.05	0.92	0.73
12	4.95	7.50	15.00	64.50	0.13	5.98	0.94	1.00
16	6.75	7.73	14.79	61.71	0.37	6.22	1.27	1.15

Decomposition of Variance for Series CYC_LA_CPI

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LA_ GDP	CYC_LA_ CPI	CYC_LA_ FOREX	CYC_A_ R	CYC_LA_ ER
1	1.07	0.36	0.89	0.10	97.58	0.00	0.00	0.00
2	2.60	1.34	1.93	0.49	91.48	0.29	1.00	0.87
4	2.18	4.48	2.13	1.00	71.76	14.70	2.68	1.06
8	5.31	11.72	2.18	7.23	47.48	21.56	3.54	0.98
12	9.41	13.41	2.11	13.62	38.79	17.53	4.19	0.93
16	11.28	12.88	2.43	14.91	36.05	16.62	4.96	0.87

Decomposition of Variance for Series CYC_LA_FOREX

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LA_ GDP	CYC_LA_ CPI	CYC_LA_ FOREX	CYC_A_ R	CYC_LA_ ER
1	0.93	4.77	5.32	6.85	1.81	80.31	0.00	0.00
2	0.67	4.37	6.28	7.38	1.98	79.25	0.07	0.00
4	0.67	3.47	12.56	12.00	2.31	68.76	0.23	0.00
8	1.71	3.17	15.25	17.80	2.88	58.39	0.61	0.18
12	2.37	3.03	14.88	17.76	3.11	57.42	0.94	0.47
16	2.38	3.09	15.43	17.72	3.13	56.73	1.02	0.49

Decomposition of Variance for Series CYC_A_R

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LA_ GDP	CYC_LA_ CPI	CYC_LA_ FOREX	CYC_A_ R	CYC_LA_ ER
1	0.60	0.16	3.93	7.08	8.70	2.52	77.01	0.00
2	0.44	0.18	2.58	4.73	9.78	2.05	79.41	0.84
4	0.33	1.05	1.77	3.87	13.56	1.44	72.62	5.36
8	1.82	1.96	1.50	3.41	13.75	1.21	62.19	14.16
12	5.63	2.03	1.38	3.88	12.91	1.16	56.33	16.69
16	8.79	2.68	1.28	4.59	12.79	1.70	51.94	16.21

Decomposition of Variance for Series CYC_LA_ER

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LA_ GDP	CYC_LA_ CPI	CYC_LA_ FOREX	CYC_A_ R	CYC_LA_ ER
1	3.94	0.18	0.79	25.92	15.65	5.45	11.26	36.80
2	3.36	1.00	0.89	20.94	15.58	6.67	12.42	39.15
4	2.76	5.42	0.96	21.31	15.16	9.10	11.01	34.29
8	2.33	12.52	1.18	22.20	13.61	9.61	9.29	29.25
12	2.42	15.22	1.30	21.58	13.14	9.29	9.00	28.05
16	2.98	15.99	1.29	21.42	12.86	9.24	8.80	27.41

Brazil

Decomposition of Variance for Series CYC_LB_GDP

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LB_ GDP	CYC_LB_ CPI	CYC_LB_ FOREX	CYC_ B_R	CYC_LB_ ER
1	0.33	4.15	1.10	94.41	0.00	0.00	0.00	0.00
2	0.33	13.21	0.96	84.61	0.10	0.25	0.05	0.49
4	0.63	25.70	1.01	58.99	9.20	0.65	0.04	3.78
8	8.28	29.03	0.89	41.36	10.49	1.48	0.45	8.02
12	19.80	26.11	1.03	33.48	8.31	3.27	0.53	7.47
16	26.48	23.48	0.98	29.89	7.35	4.67	0.48	6.68

Decomposition of Variance for Series CYC_LB_CPI

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LB_ GDP	CYC_LB_ CPI	CYC_LB_ FOREX	CYC_ B_R	CYC_LB_ ER
1	6.25	0.30	2.62	6.09	84.73	0.00	0.00	0.00
2	8.62	0.49	2.15	4.74	83.18	0.01	0.65	0.16
4	7.76	1.57	1.85	7.63	72.90	0.66	6.02	1.61
8	7.52	3.96	1.86	7.01	65.97	1.11	10.23	2.34
12	8.34	4.09	2.38	6.65	64.54	1.49	10.27	2.25
16	8.44	4.07	2.77	6.60	64.12	1.53	10.20	2.27

Decomposition of Variance for Series CYC_LB_FOREX

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LB_ GDP	CYC_LB_ CPI	CYC_LB_ FOREX	CYC_ B_R	CYC_LB_ ER
1	7.06	0.03	0.53	2.05	0.08	90.26	0.00	0.00
2	6.97	0.36	0.45	5.19	0.20	86.26	0.29	0.28
4	5.95	0.45	3.07	6.11	0.83	81.63	1.44	0.53
8	5.91	0.73	7.65	5.74	1.47	74.31	2.96	1.23
12	6.30	1.00	8.29	5.53	2.53	71.17	3.12	2.06
16	7.33	1.20	8.21	5.51	2.63	69.92	3.06	2.13

Decomposition of Variance for Series CYC_B_R

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LB_ GDP	CYC_LB_ CPI	CYC_LB_ FOREX	CYC_ B_R	CYC_LB_ ER
1	2.80	0.13	2.51	10.90	70.91	1.38	11.36	0.00
2	3.08	0.10	1.75	8.84	72.37	2.48	11.35	0.03
4	2.86	0.09	1.81	9.10	71.24	4.30	10.56	0.04
8	2.94	0.26	1.85	9.96	69.40	4.55	10.73	0.32
12	3.65	0.37	1.81	9.69	68.45	4.66	10.86	0.51
16	3.97	0.37	1.79	9.59	68.19	4.74	10.81	0.52

Decomposition of Variance for Series CYC_LB_ER

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LB_ GDP	CYC_LB_ CPI	CYC_LB_ FOREX	CYC_ B_R	CYC_LB_ ER
1	0.09	0.11	4.88	3.93	2.66	0.87	8.66	78.79
2	0.08	0.14	5.40	3.82	2.07	0.91	8.91	78.66
4	0.25	0.48	4.71	3.36	3.62	2.21	8.14	77.21
8	2.38	1.75	8.13	3.45	5.27	2.68	7.18	69.16
12	5.94	2.22	7.87	3.61	5.55	2.91	6.87	65.03
16	8.88	2.22	7.57	3.65	5.38	3.39	6.59	62.31

Chile

Decomposition of Variance for Series CYC_LC_GDP

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LC_ GDP	CYC_LC_ CPI	CYC_LC_ FOREX	CYC_C_ R	CYC_LC_ ER
1	5.90	3.28	0.32	90.50	0.00	0.00	0.00	0.00
2	5.62	6.53	0.22	85.59	0.03	0.86	1.03	0.10
4	6.70	18.84	2.04	65.88	0.13	0.55	5.59	0.26
8	5.89	36.39	1.76	45.33	0.48	2.64	6.08	1.43
12	4.93	41.22	1.45	36.18	5.22	3.19	4.87	2.93
16	5.26	39.04	1.57	31.86	11.22	2.91	4.31	3.85

Decomposition of Variance for Series CYC_LC_CPI

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LC_ GDP	CYC_LC_ CPI	CYC_LC_ FOREX	CYC_C_ R	CYC_LC_ ER
1	0.01	6.69	0.88	0.07	92.35	0.00	0.00	0.00
2	0.06	5.65	1.33	0.31	92.44	0.19	0.01	0.01
4	0.06	5.06	3.56	0.24	83.97	5.82	0.04	1.23
8	0.12	8.30	6.12	0.29	73.06	10.56	0.07	1.49
12	0.20	11.24	6.03	0.32	69.85	10.38	0.09	1.89
16	0.22	11.80	5.86	0.32	69.46	10.00	0.09	2.25

Decomposition of Variance for Series CYC_LC_FOREX

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LC_ GDP	CYC_LC_ CPI	CYC_LC_ FOREX	CYC_C_ R	CYC_LC_ ER
1	1.03	0.19	4.14	0.12	1.13	93.38	0.00	0.00
2	0.77	0.62	3.43	0.10	1.21	93.79	0.05	0.06
4	0.71	0.69	4.57	0.12	2.73	90.85	0.24	0.09
8	0.73	0.67	7.71	0.16	3.30	86.79	0.55	0.08
12	0.98	0.70	7.82	0.22	3.60	85.99	0.57	0.11
16	1.11	0.71	7.79	0.29	3.72	85.67	0.58	0.12

Decomposition of Variance for Series CYC_C_R

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LC_ GDP	CYC_LC_ CPI	CYC_LC_ FOREX	CYC_C_ R	CYC_LC_ ER
1	8.26	2.43	16.95	6.56	0.21	0.29	65.29	0.00
2	12.43	2.13	12.04	5.20	0.22	1.68	66.19	0.11
4	14.33	1.96	14.91	4.52	0.25	2.09	61.72	0.21
8	12.17	3.47	22.10	4.14	1.02	2.85	54.06	0.18
12	12.20	4.05	21.61	4.16	1.57	3.82	52.40	0.18
16	12.33	4.32	21.37	4.29	1.84	3.85	51.75	0.25

Decomposition of Variance for Series CYC_LC_ER

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LC_ GDP	CYC_LC_ CPI	CYC_LC_ FOREX	CYC_C_ R	CYC_LC_ ER
1	1.84	6.77	4.09	0.42	0.40	4.14	0.00	82.32
2	4.25	5.88	3.36	1.16	0.30	3.56	0.31	81.18
4	4.56	6.86	3.99	1.61	0.30	3.48	0.68	78.52
8	4.54	7.84	4.10	1.88	0.40	3.60	0.79	76.84
12	4.65	7.83	4.08	2.02	0.67	3.60	0.81	76.35
16	4.72	7.82	4.09	2.11	0.78	3.63	0.82	76.04

Mexico

Decomposition of Variance for Series CYC_LM_GDP

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LM_ GDP	CYC_LM_ CPI	CYC_LM_ FOREX	CYC_M_ R	CYC_LM_ ER
1	1.14	1.58	0.71	96.56	0.00	0.00	0.00	0.00
2	1.48	3.70	1.73	91.70	0.48	0.00	0.00	0.91
4	2.74	5.23	5.24	78.16	1.44	0.24	0.16	6.80
8	3.15	5.41	5.03	66.05	3.55	0.35	3.81	12.64
12	3.02	6.58	5.21	62.37	3.75	0.76	5.65	12.67
16	3.16	7.79	5.12	60.18	4.75	1.06	5.73	12.22

Decomposition of Variance for Series CYC_LM_CPI

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LM_ GDP	CYC_LM_ CPI	CYC_LM_ FOREX	CYC_M_ R	CYC_LM_ ER
1	3.10	0.18	0.65	6.58	89.49	0.00	0.00	0.00
2	2.52	0.17	1.01	4.34	91.56	0.22	0.01	0.18
4	2.29	0.24	0.86	3.48	89.08	3.86	0.02	0.18
8	2.05	0.31	1.11	3.33	82.23	10.51	0.03	0.43
12	2.18	0.31	1.48	3.24	80.30	11.96	0.09	0.43
16	2.42	0.31	1.49	3.21	80.15	11.85	0.13	0.43

Decomposition of Variance for Series CYC_LM_FOREX

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LM_ GDP	CYC_LM_ CPI	CYC_LM_ FOREX	CYC_M_ R	CYC_LM_ ER
1	0.22	4.71	0.03	1.53	0.47	93.03	0.00	0.00
2	0.25	6.55	0.08	1.16	2.55	89.20	0.10	0.11
4	0.22	7.96	0.32	0.93	9.16	80.17	1.11	0.13
8	1.44	9.43	0.56	0.93	15.57	68.78	2.61	0.69
12	3.50	10.38	0.61	1.23	15.66	64.53	3.04	1.04
16	5.23	10.76	0.63	2.42	14.99	61.79	3.02	1.15

Decomposition of Variance for Series CYC_M_R

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LM_ GDP	CYC_LM_ CPI	CYC_LM_ FOREX	CYC_M_ R	CYC_LM_ ER
1	3.35	2.49	11.19	0.51	18.42	1.17	62.88	0.00
2	2.61	2.12	10.05	3.77	13.34	1.23	66.63	0.26
4	2.20	2.24	9.07	5.15	19.69	2.27	57.89	1.50
8	2.72	3.66	7.64	5.65	22.49	7.01	49.17	1.66
12	4.61	4.31	7.27	6.17	21.23	8.50	46.30	1.61
16	6.59	4.44	6.98	6.46	21.35	8.24	44.31	1.63

Decomposition of Variance for Series CYC_LM_ER

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LM_ GDP	CYC_LM_ CPI	CYC_LM_ FOREX	CYC_M_ R	CYC_LM_ ER
1	0.12	2.90	0.26	0.32	0.46	0.42	20.82	74.71
2	0.09	2.62	0.23	0.98	1.40	1.66	18.33	74.69
4	0.14	1.76	1.46	2.97	17.50	4.51	14.94	56.71
8	0.17	1.74	1.97	3.26	22.06	4.81	17.45	48.55
12	0.18	2.48	2.17	3.28	21.77	4.75	17.64	47.72
16	0.34	3.05	2.17	3.44	21.87	4.74	17.43	46.96

Uruguay

Decomposition of Variance for Series CYC_LU_GDP

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LU_ GDP	CYC_LU_ CPI	CYC_LU_ FOREX	CYC_U_ R	CYC_LU_ ER
1	0.80	0.25	3.10	95.85	0.00	0.00	0.00	0.00
2	0.54	0.16	4.94	92.59	0.05	0.40	1.20	0.12
4	0.92	0.98	12.33	82.20	0.07	0.53	1.13	1.85
8	1.33	2.79	15.90	69.87	0.13	0.61	6.33	3.04
12	1.29	2.81	15.43	68.05	0.14	0.63	8.28	3.37
16	1.27	3.18	15.50	67.32	0.18	0.70	8.25	3.59

Decomposition of Variance for Series CYC_LU_CPI

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LU_ GDP	CYC_LU_ CPI	CYC_LU_ FOREX	CYC_U_ R	CYC_LU_ ER
1	1.94	1.06	10.73	7.91	78.36	0.00	0.00	0.00
2	2.17	3.56	11.15	6.41	75.91	0.58	0.23	0.00
4	1.17	13.63	12.03	5.54	65.93	1.02	0.28	0.40
8	5.48	32.57	8.75	3.15	41.35	1.40	4.27	3.03
12	12.61	35.62	6.49	4.56	26.00	1.30	8.59	4.82
16	16.01	31.10	10.04	6.46	21.63	1.04	9.05	4.68

Decomposition of Variance for Series CYC_LU_FOREX

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LU_ GDP	CYC_LU_ CPI	CYC_LU_ FOREX	CYC_U_ R	CYC_LU_ ER
1	0.29	0.70	0.80	1.13	0.02	97.05	0.00	0.00
2	1.49	0.70	1.10	0.92	0.20	94.24	0.84	0.51
4	1.49	0.74	1.00	6.21	0.22	88.05	1.50	0.79
8	1.42	0.72	1.09	8.70	0.42	83.28	2.48	1.89
12	1.68	0.88	1.46	8.60	0.47	81.95	2.85	2.11
16	2.09	1.41	1.68	8.49	0.52	80.88	2.84	2.09

Decomposition of Variance for Series CYC_U_R

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LU_ GDP	CYC_LU_ CPI	CYC_LU_ FOREX	CYC_U_ R	CYC_LU_ ER
1	0.07	0.00	2.70	0.48	3.76	3.02	89.97	0.00
2	0.30	0.15	2.17	0.50	3.73	2.58	90.26	0.31
4	0.40	0.20	1.84	1.04	3.72	2.19	90.10	0.52
8	0.42	0.21	2.03	1.86	3.64	2.52	87.15	2.16
12	0.63	0.22	2.74	2.12	3.64	2.69	85.52	2.44
16	0.78	0.23	3.19	2.11	3.77	2.68	84.78	2.45

Decomposition of Variance for Series CYC_LU_ER

Step	CYC_ LGDPG7	CYC_ LWCPNO	CYC_ EMBI	CYC_LU_ GDP	CYC_LU_ CPI	CYC_LU_ FOREX	CYC_U_ R	CYC_LU_ ER
1	2.30	0.86	9.28	23.97	6.82	0.00	2.74	54.03
2	2.48	1.11	8.88	19.89	7.41	0.89	2.08	57.25
4	2.02	0.92	8.60	15.02	7.01	6.51	2.28	57.63
8	5.06	1.94	7.95	16.17	5.89	9.36	2.25	51.38
12	7.56	2.51	11.15	15.97	6.57	8.45	2.00	45.79
16	8.12	2.55	13.32	15.14	7.84	8.02	1.88	43.13